

WHAT IS CLAIMED IS:

- 1                    1.        An apparatus for carrying a load during a medical procedure, the  
2 apparatus comprising:  
3                    a base;  
4                    an articulating arm having a distal end and a proximal end secured in a  
5 movable fashion to said base;  
6                    at least one positional encoder coupled to said arm;  
7                    a receptacle at the distal end for carrying an effector;  
8                    means for load balancing said arm when said effector is engaged; and  
9                    a controller coupled to the positional encoder(s) to track the position of the  
10 arm in real time.
- 1                    2.        The apparatus as described in claim 1, wherein said controller is a  
2 closed loop control device.
- 1                    3.        The apparatus as described in claim 1, wherein said controller is a  
2 position tracking device.
- 1                    4.        The apparatus as described in claim 2, wherein said closed loop control  
2 device is also able to track orientation of the arm in real time.
- 1                    5.        The apparatus as described in claim 1, wherein the means for load  
2 balancing is a robotic driver in electronic communication with said positional encoder(s)  
3 wherein the robotic driver can position the articulating arm according to a set of input  
4 commands.
- 1                    6.        The apparatus as described in claim 4, wherein said input commands  
2 further comprises a series of movement commands for said robotic driver.
- 1                    7.        The apparatus as described in claim 1, wherein the means for load  
2 balancing is one or more passive force generating device(s).
- 1                    8.        The apparatus as described in claim 1, wherein the means for load  
2 balancing is one or more active force generating device(s).

1                    9.        The apparatus as described in claim 1, wherein the means for load  
2 balancing is a combination of one or more passive force generating device(s) and one or more  
3 active force generating device(s).

1                    10.      The apparatus as described in claim 1, wherein the means for load  
2 balancing is one or more cooperative motors.

1                    11.      The apparatus as described in claim 1, wherein the means for load  
2 balancing is a plurality of springs and counter balancing weights.

1                    12.      The apparatus as described in claim 1, wherein the medical procedure  
2 is a procedure for the reduction in adipose tissue.

1                    13.      The apparatus as described in claim 1, wherein the therapy head  
2 includes a high intensity focused ultrasound transducer.

1                    14.      The apparatus as described in claim 1, wherein said encoders are in  
2 electronic communication with a computer, and said computer controls said means for load  
3 balancing.

1                    15.      The apparatus as described in claim 1 further comprising a feather  
2 touch.

1                    16.      The apparatus as described in claim 1, wherein said base is anchored to  
2 a wall, ceiling or other fixture.

1                    17.      The apparatus as described in claim 1, wherein said base is a cart.

1                    18.      The apparatus as described in claim 1, wherein said base is anchored to  
2 an examination table.

1                    19.      The apparatus as described in claim 1, wherein encoder(s) are  
2 rotational encoders incorporated into one or more joints of said articulating arm.

1                    20.      The apparatus as described in claim 1, wherein said encoder(s) are  
2 linear encoders.

1                   21.     The apparatus as described in claim 1, wherein said encoder(s) are one  
2 or more position sensors.

1                   22.     The apparatus as described in claim 1, further comprising a motion  
2 sensor.

1                   23.     An apparatus for precise positioning of a medical device comprising:  
2 a base;  
3 a robotic articulating arm having a base end attached to said base and an  
4 unsecured end attached to an effector capable of holding one or more medical devices;  
5 at least one position sensor located substantially near said unsecured end and  
6 capable of determining the precise position of said effector relative to a patient and said base;  
7 and  
8 a controller in electronic communication with said motion sensor;  
9 wherein the controller utilizes data from the sensor to control the robotic  
10 articulating arm to maintain the location of the one or more medical device relative to a  
11 patient in real time.

1                   24.     The apparatus as described in claim 23, wherein the base is  
2 anchored to a wall surface.

1                   25.     The apparatus as described in claim 23, wherein said robotic  
2 articulating arm has a plurality of arm segments separated by a joint between each said arm  
3 segment.

1                   26.     The apparatus as described in claim 23, wherein the motion sensor  
2 tracks the position of each joint of said articulating arm in addition to the procedural end.

1                   27.     The apparatus as described in claim 23, wherein said one or more  
2 medical devices may be positionally controlled through said controller.

1                   28.     The apparatus as described in claim 23, wherein the controller is a  
2 computer utilizing a robotic software controller (PLC).

1                   29.     The apparatus as described in claim 23, wherein said one or more  
2 medical devices consists of at least one ultrasound transducer.

1                   30.     The apparatus as described in claim 29, wherein said ultrasound  
2 transducer is a therapeutic ultrasound transducer.

1                   31.     The apparatus as described in claim 23, further comprising a joint  
2 between said base and said base end, so that said base end may be positioned relative to said  
3 base.

1                   32.     The apparatus as described in claim 23, wherein said articulating arm  
2 is a telescoping arm.

1                   33.     The apparatus as described in claim 23, wherein said robotic  
2 articulating arm is moveable relative to said base.

1                   34.     The apparatus as described in claim 23, further comprising an  
2 examination table.

1                   35.     The apparatus as described in claim 23, wherein the robotic arm may  
2 be manually moved with in a programmed limited space, and the articulating elements  
3 prevent any manual movement outside the pre-programmed field of movement.

1                   36.     The apparatus as described in claim 23, wherein the base is a fixture.

1                   37.     The apparatus as described in claim 36, wherein the fixture is a wall,  
2 floor or ceiling of a room.

1                   38.     A method of controlling an articulating arm through at least one force  
2 generating device comprising the steps of:

- 3                   (a) determining a desired position for said articulating arm;  
4                   (b) converting said desired position to a plurality of component coordinates;  
5                   (c) calculating a first time position coordinate for each of said plurality of  
6 components;  
7                   (d) transmitting a force changing command to said force generating device;  
8                   (e) calculating a subsequent time position coordinate for each said plurality of  
9 components;  
10                  (f) comparing said subsequent time position coordinate to said desired  
11 position; and

12 (g) adjusting said force changing commands until said articulating arm  
13 achieves said desired position.

1 39. A method as in claim 38, wherein adjusting said force changing  
2 commands occurs continuously.